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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/763,239	01/26/2004	Takao Harada	248043US3	6689

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OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C.
1940 DUKE STREET
ALEXANDRIA, VA 22314

EXAMINER	
MCNELIS, KATHLEEN A	

ART UNIT	PAPER NUMBER
1742	

DATE MAILED: 06/07/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/763,239	HARADA ET AL.	
	Examiner	Art Unit	
	Kathleen A. McNelis	1742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *4/26/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Claims Status

Claims 1-6 are pending.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1 and 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoffman et al. (U.S. Pat. No. 6,749,664) or Meissner et al. (U.S. Pat. No. 5,730,775) or Kamei et al. (U.S. Pat. No. 6,284,017) in view of Fuji et al. (U.S. Pat. No. 6,129,777).

Hoffman et al. discloses an apparatus and method for direct reduction of iron oxide with carbonaceous reductant using a rotary hearth furnace (abstract and Fig. 1) wherein fuel is provided to a plurality of oxygen enriched burners (col. 4 lines 9-27 and Fig. 1).

Meissner et al. discloses a method and apparatus for producing direct reduced iron from dry compacts of iron oxide and carbonaceous material in a rotary hearth furnace (abstract and Fig. 1) wherein oxygen enriched air and fuel is supplied to multiple burners (col. 5 line 66 – col. 6 line 11 and Fig. 2).

Kamei et al. discloses a method for producing reduced iron from iron oxides with reductant in a rotary hearth furnace (abstract and Fig. 1) where carbonaceous material is used as the solid reductant (Col. 1 lines 10-20), fuel and oxygen containing gas are combusted in multiple burners (Col. 10 lines 28-36 and Fig. 5) and oxygen enriched air is used as the oxygen containing gas (col. 9 lines 3-6).

Hoffman et al. or Meissner et al. or Kamei et al. does not disclose using secondary combustion air as taught in instant claim 1.

Fuji et al. discloses a method of reducing iron oxide with carbonaceous material on a moving hearth furnace (abstract). Fuji et al. teaches providing a supply of secondary combustion air to burn combustible gases generated from the carbonaceous material in the vicinity of the iron oxide agglomerates to decrease the amount of fuel required for heating (col. 4 lines 23- 31). It would have been obvious to one of ordinary skill in the art at the time the invention was made to burn combustible gases generated from the carbonaceous material with secondary combustion air

as taught by Fuji et al. in the iron oxide reduction process of Hoffman et al. or Meissner et al. or Kamei et al. to decrease the amount of fuel required for heating as taught by Fuji et al.

Hoffman et al. or Meissner et al. or Kamei et al. does not disclose that the degree of reduction represented by the formula $(CO + H_2)/(CO + CO_2 + H_2 + H_2O)$ in the atmospheric gas is less than 0.05 as in instant claim 4, that a plurality of primary burners has an air ratio of 1.0 or less as in instant claim 5, or that the burners have different air ratios as in instant claim 6.

In example 3, Fuji et al. varies the oxidation ratio of the combustion gas $[(CO_2 + H_2O)/(CO + CO_2 + H_2 + H_2O)]$ from 0 to 1.0 in the latter half of the reduction process (col. 5 lines 25-58). One of ordinary skill in the art would recognize that algebraically, the sum of the oxidation ratio disclose by Fuji et al. plus the degree of reduction disclosed by instant claim 4 must equal 1.0, i.e.:

$$\left(\frac{CO_2 + H_2O}{CO + H_2 + CO_2 + H_2O}\right) + \left(\frac{CO + H_2}{CO + H_2 + CO_2 + H_2O}\right) = 1.0$$

Therefore, by varying the oxidation ratio from 0 to 1.0 in the later half of the reduction process, Fuji et al. also varies the degree of reduction from 1.0 to 0. The range of between 0 and 1.0 overlaps the claimed range of less than 0.05 (claim 4) and "has an air ratio of 1.0 or less" (claim 5). It has been well settled that where the applied prior art teaches a range of compositions or properties overlapping a claimed range, a prima facie case of obviousness exists (M.P.E.P § 2144.05). Further, Fuji et al. shows that the degree of oxidation in the combustion gas is a result effective variable, which along with the time the ratio is changed affects the metallization ratio of the iron (col. 5 lines 25-58 and Fig. 4). It would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the oxidation ratio (and therefore degree of

reduction) as result-effective variables to affect the metallization ratio of the iron (see M.P.E.P 2144.05, II, B). With respect to claim 6, Fuji et al. teaches "switching" to a lower oxidation ratio at different times in the reduction process (col. 5 lines 25-59). Since the process of Hoffman et al. or Meissner et al. or Kamei et al. in view of Fuji et al. is a traveling hearth furnace, and since a plurality of burners are disclosed in different furnace zones, one of ordinary skill in the art would expect that the "switch" is accomplished by using burners with different oxidation ratios so that the agglomerates are exposed to different oxidizing/reducing atmospheres as the hearth moves the agglomerates through the furnace.

Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoffman et al. (U.S. Pat. No. 6,749,664) or Meissner et al. (U.S. Pat. No. 5,730,775) or Kamei et al. (U.S. Pat. No. 6,284,017) in view of Fuji et al. (U.S. Pat. No. 6,129,777) as applied to claim 1 alone or in further view of Nishimura et al. (U.S. Pat. No. 6,296,479).

Hoffman et al. or Meissner et al. or Kamei et al. in view of Fuji et al. discloses a method for direct reduction of iron oxide with carbonaceous reductant using a rotary hearth furnace wherein fuel is provided to multiply placed oxygen enriched burners and both primary and secondary combustion air is provided. Fuji et al. teaches the use of secondary combustion air to burn the CO and decrease the requirement for supplemental fuel as discussed above regarding claim 1.

It is the examiner's position, in the lack of evidence to the contrary, that since the process disclosed by Hoffman et al. or Meissner et al. or Kamei et al. in view of Fuji et al. is essentially the same as the claimed process, the CO concentration in the atmospheric gas in the furnace in the vicinity of at least one of the primary burners is less that 2 volume % as in instant claim 2 and less than 4 volume % as in instant claim 3.

Alternatively, Hoffman et al. or Meissner et al. or Kamei et al. in view of Fuji et al. does not disclose that the CO concentration in the atmospheric gas in the vicinity of at least one of the plurality of primary burners is less than 2 volume % as in instant claim 2 or less than 4 volume % as in instant claim 3.

Nishimura et al. discloses a method of direct reduction of metal oxide with a carbonaceous material in a rotary hearth furnace (abstract). Nishimura et al. discloses the use of air inlets to provide secondary combustion in the vicinity of the iron agglomerates on the hearth (Figs. 6, 7 and col. 7 lines 28-55). Nishimura et al. teaches that the CO concentration in volume (%) is a function of at least the distance from the hearth inner wall as shown on Fig. 9. One of ordinary skill in the art would therefore expect the concentration of CO to vary with distance from the hearth inner wall as taught by Nishimura et al., since the process of Hoffman et al. or Meissner et al. or Kamei et al. in view of Fuji et al. utilizes secondary combustion as taught by Nishimura et al.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kathleen A. McNelis whose telephone number is 571- 272-3554. The examiner can normally be reached on M-F 8:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

ROY KING
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700